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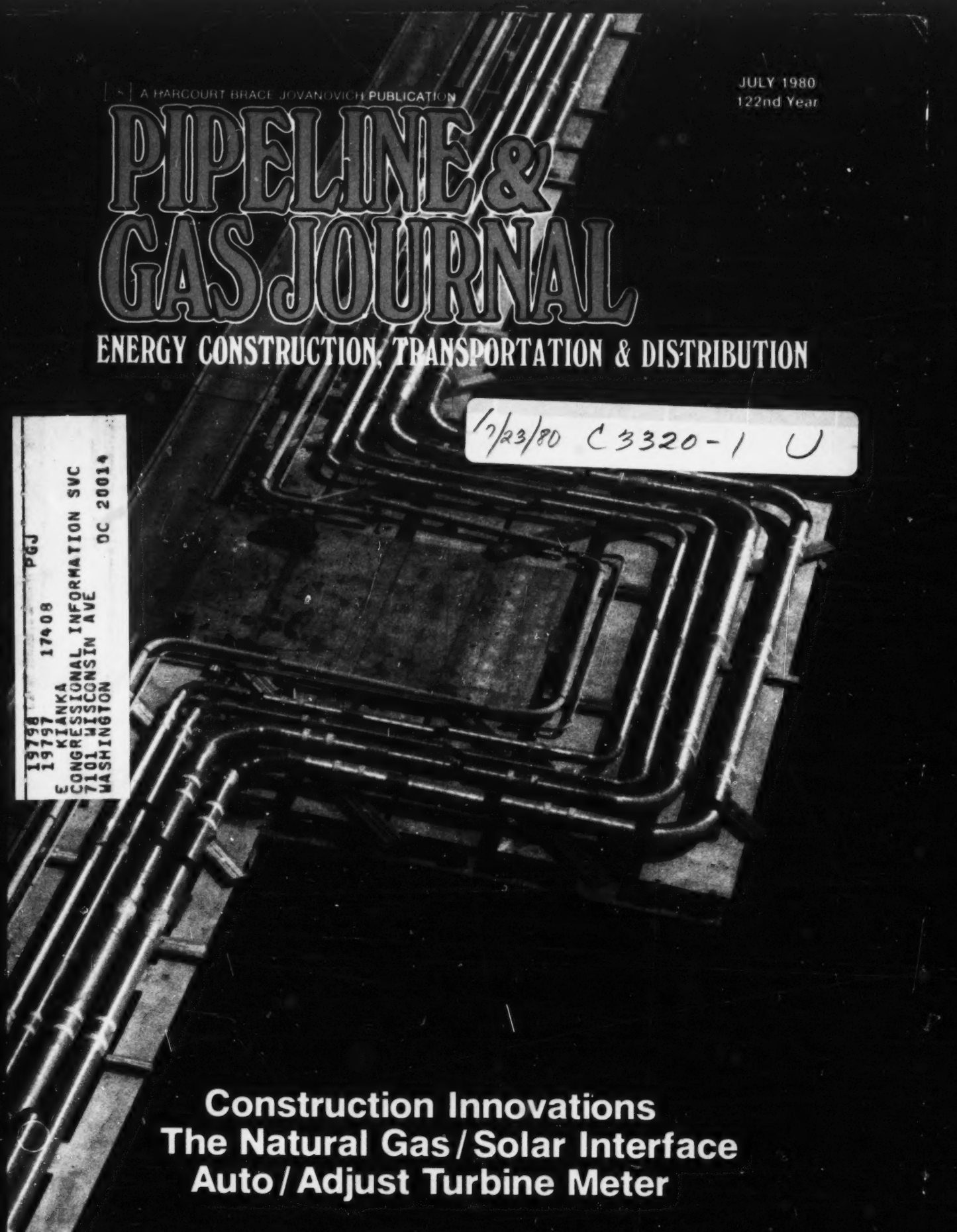

Construction Innovations
The Natural Gas / Solar Interface
Auto / Adjust Turbine Meter

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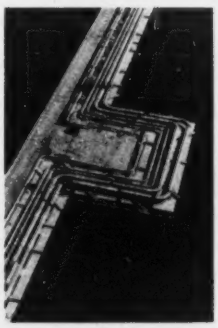


THE COVER

Aerial view of the Ju'aymah pipeline trestle in the Arabian Gulf; see page 39 for details on the trestle, a $4.5 billion facility that carries 36- and 48-in. insulated LPG pipelines.

—Photo courtesy Raymond International

Construction Innovations 17

Pipeliners ... on land or on sea ... rise to meet the challenge with unique equipment applications and methods to answer specific needs; this year's crop includes a foam-filled joint for concrete pipe used offshore; a hydraulic drill that fits the end of a backhoe boom; an undersea trencher that can cut through rock; slippery pigs to coat pipes internally; a small-diameter internal lineup clamp; a special bending shoe for insulated pipe; live insertion of plastic pipe into old mains without loss of gas; a boltless flange for making subsea connections and repairs; a "superboom" for handling big (48-in. and larger) pipe that has a 100-ton capacity, and backhoe-mounted paving breakers.

The Natural Gas/Solar Interface 22

What impact will solar energy utilization have on the natural gas utility business? There are many problems foreseen, beginning with the question of whether full-time gas customers should utilize (through rates) the night-time, part-time user of gas energy ... and going on through the probability of gas utility-supported research and utilization programs (such as solar water heating supplemented by gas heaters) to answering questions about what appear to be really unattractive economics in solar-based energy approaches.

The Auto-Adjust Turbo-Meter 26

The turbine meter for large volume natural gas measurement has many advantages, including rangeability, compact size, and simplified field maintenance. Now, another improvement has been added... a method that permits automatic adjustment of accuracy to initial calibration despite meter component wear, along with self-check of mechanical or electrical condition and advance warning of deteriorating condition well before meter failure might occur.

Ju'aymah Pipeline Trestle
Extremely Sophisticated Project 39

A six-mile-long concrete pipeline support trestle, costing $4.5 billion, has been installed in the Arabian Gulf at Ju'aymah using a very sophisticated computerized survey system and the latest technology in piledriving and pile-setting.

FINANCIAL NOTEBOOK

Money Market, Mergers, Acquisitions, Executive Changes, Capital Expenditures

Company	Oil ($/Bbl) 1980	Oil ($/Bbl) 1979	Gas ($/Mcf) 1980	Gas ($/Mcf) 1979
C&K Petroleum[3]	$20.40[e]	$14.49	$2.05[e]	$1.93
Consolidated Oil & Gas	17.48	9.48	2.38	1.68
Dorchester Gas[1]	24.25	12.58	1.07	0.74
Energy Reserves Group	27.91	13.04	1.48	1.26
Forest Oil	17.74	11.53	1.65	1.40
General American Oil[2]	17.37	10.09	1.50	1.02
Lear Petroleum	27.70	15.90	2.43	1.68
Louisiana L&E	13.07	10.54	1.60	1.11
Mapco	22.96	12.23	0.87	0.52
McAlester Fuel Co.[3]	15.45	10.41	2.31	1.75
Patrick Petroleum[4]	19.57	10.07	1.74	1.66
Petro-Lewis	19.09	11.30	1.64	1.25
Southland Royalty	16.83	9.21	1.88	1.44
Superior Oil	16.55	9.06	1.58	1.20
Supron Energy	19.86	10.18	1.63	1.40
Triton Oil & Gas[2]	25.88	11.13	1.67	0.87
Williams Cos.[3]	13.57[e]	9.50	2.82[e]	2.28

[1]Quarters ended Feb. 29, 1979/80. [2]Nine months ends March 31. [3]1979 figures are for full year. [4]Quarter ends Jan. 31. [e]Company estimate of whole year.

PRICE INCREASES FOR U.S. oil and gas during 1979 are reflected in this table. Prices are the average received by independent producers on U.S. sales for quarters ended March 31, 1979 and 1980, unless otherwise noted.

Average oil prices doubled in some cases while average gas prices rose on the order of 20% to 50%. Higher prices resulted from phase-out of controls on established oil production, higher federal ceilings on new gas production and de-control of new oil and deep gas production.

INTERNATIONAL EXPLORATION CONTRACTS were inked by a number of Western oil firms. Union Oil of California and Inalruco S.A. of Argentina bid $20.5 million to win a 5-year risk contract for Llancanelo block in western Argentina. Project calls for some $20 million outlays to explore for heavy crude in more than 600,000 acres.

Occidental Petroleum signed agreement with Ecopetrol, state oil firm of Colombia, covering five blocks (some 12.3 million acres) in eastern Colombia. Oxy will drill four wells on each block during first year of 6-year contract. Ecopetrol will be 50% partner in any commercial oil discovery.

Unit of Coastal Corp. signed agreement with Libyan National Oil Co. to explore and develop oil reserves in 7 million acres in northeastern Libya. Coastal must drill 13 wildcats and will have production share ranging from 10% to 19%. If production is established, a 20-year contract will be signed.

Union Texas Petroleum (Dow Chemical), operator for three firms, signed an agreement with ETAP, state oil company of Tunisia, covering 1.8 million acres in north central Tunisia. Union Texas has 40%, AGIP (state oil firm of Italy) has 40% and Anadarko Production (Panhandle Eastern Pipeline) has 20%.

Compagnie Francaise des Petroles has agreement with Sonatrach, state oil entity of Algeria, to explore an area around Hassi R'Mel gas field over 4 years, with expenditures estimated at $52 million....Standard Oil (Ohio) units obtained interest in 900,000-acre tract near Algeria's El Borma field next to Tunisia.

CFP and Elf Aquitaine signed agreements with China's national oil entity to explore 7500 sq miles in China's Bay of Pohai and Gulf of Beibu. French firms will have 49% interest and China 51%.

ACQUISITIONS. Atlantic Richfield sold its 60% interest in Colony oil shale project to Exxon for $400 million. Tosco Corp. holds the other 40%. Earlier this year, Tosco said the $1.7 billion project, which has a final environmental impact statement, will begin as soon as Congress enacts synfuels legislation.

McMoRan Oil & Gas agreed to sell two subsidiaries representing all its Canadian oil/gas interests to Willowdale Resources Ltd. for $11 million...Crutcher Resources agreed to buy all common stock of KBM Well Service, Inc. (Williston, ND)

for cash and notes. KBM operates 11 well servicing rigs rated to 15,000 ft in Williston Basin.

Crown Central Petroleum agreed to buy North Cristoval field in Texas, with five wells now producing 300 b/d oil, from Texcan Resources for $8.7 million

Henderson Petroleum agreed to buy interest in two deep gas wells in Custer County, OK, plus undeveloped acreage, for $800,000 and to buy Bixler Energy, Inc. (Denver) for 165,000 Henderson common shares. Bixler owns 20% interest in eight producing oil/gas wells in Okmulgee County, OK.

JOINT VENTURES. Units of McMoRan Oil & Gas formed two separate joint exploration ventures with major partners Transco Exploration and Freeport Oil over 3 years. McMoRan will have 37.5% interest in onshore Gulf Coast exploration and 35% offshore in Gulf of Mexico. In all, some $252 million will be spent.

Gulf Oil and Conoco, Inc. formed partnership to conduct a $73 million oil search in Williston Basin in Montana and North Dakota. Project will take 4 years and cover some 10,000 sq mi. Seismic and drilling already have begun.

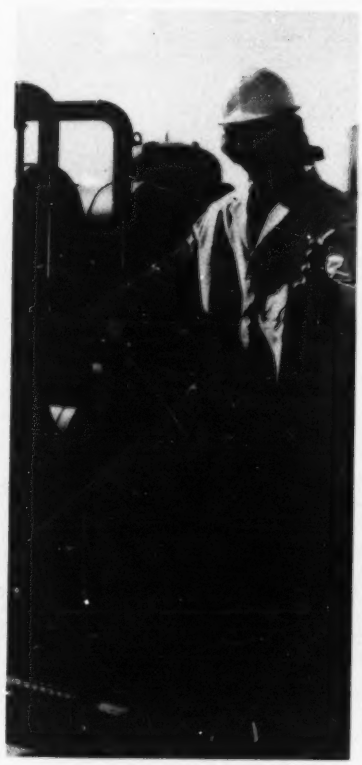
Columbia Gas System's Canadian unit and four other Canadian firms plan a $60 million joint exploration on 18 million acres in Canada over 3 years. Columbia's share of outlays is $15 million. Other firms are Coseka Resources, Teck Corp., Clarion Corp. and Sulpetro Ltd.

Southern Natural Gas agreed to become equal partner with United Gas Pipe Line in proposed Trans-Anadarko Pipeline System, a 635-mile line from Texas panhandle to North Louisiana expected to cost about $400 million.

Joint venture of McCulloch Oil Corp. and Geothermal Kinetics, Inc. received $49.4 million geothermal loan guarantee from Department of Energy, largest yet granted by DOE. Venture will borrow funds from Bank of Montreal (California) and Bank of America to develop resources in California's Imperial Valley.

ARCO Chemical and Mitsubishi Petrochemical agreed to form joint venture for oilfield and refinery process chemicals business in Asia.

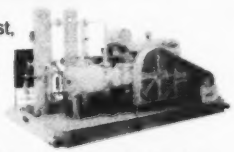
"Our portable KHB compressor from Ki has already paid for itself."



You might not think a portable 50 hp gas compressor could contribute much to your profit picture these days. But it can. We've used ours for short term well tests. And for generating income from low production wells which have been shut in till the economics became more favorable.

Ki's KHB belt driven horizontal compressor is skid-mounted for easy portability. It's available in one or two stage units for 25 to 75 hp service. Has a 5-inch stroke and is capable of 10,000 lbs. rod loading. Variable clearance cylinder heads make it easy to fine-tune performance or adjust compression to changing field conditions.

Need low cost, portable compression equipment in your operation?



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When it comes to compressors, Ki does it all. And does it better.

Capital Outlays Top $100 Billion

WORLDWIDE OIL/GAS INDUSTRY WILL SPEND more than a hundred billion dollars in 1980. Capital and exploratory outlays in 1980 will rise about 12%, according to our estimate. This could mean a zero "real" increase in constant dollars. Communist countries are excluded because data received are not comparable to company budgets.

National companies will spend little more on investment than they have in the past. With these firms it's hard to separate expenditures for oil/gas operations from those for, say, workers' housing. They branch out into many phases of the economy besides energy investments if their finances are in the black. This goes for national entities from Pemex to Pertamina.

Mitchell Energy & Development Corp. increased its capital budget for fiscal 1980 to $264 million from the $200 million set in December, 1979.

Shell budgeted $2.7 billion in 1980 for capital and exploratory spending. Kerr-McGee projects more than $500 million expenditures in 1980. Arkla Gas announced a $168 million construction and exploration program for 1980.

Sun Co. projects a $1 billion outlay for 1980 and in addition will spend $400 million developing Texas Pacific oil properties (bought from Seagram).

Atlantic Richfield plans to spend $3 billion this year, up from $1.8 billion invested in 1979; 71% is for U.S., mainly in Alaska, Texas and Louisiana.

Both Arco and Standard Indiana expect to increase overseas exploration and production. Standard Indiana will spend about $4 billion in 1980. Texaco boosted its 1980 budget by $500 million to $2.6 billion.

Approved by Exxon is a 1980 capital exploration budget of $7.5 billion compared to $6.859 billion in 1979. Gulf Oil approved a $3 billion budget for 1980.

Marathon says two-thirds of its $715 million capital and exploration outlays will go for developing reserves worldwide. American Petrofina plans a $105 million budget for 1980.

Large capital funds for synthetic fuels are projected for 1980/1--but Washington will supply most from oil taxes. Some will go outside the oil industry. Any company with an idea for synfuels has a chance to be financed by the Department of Energy.

Estimated Capital and Exploratory Expenditures for Oil/Gas Reserves and Facilities

(U.S. and Non-Communist Countries – Millions of Dollars)

	1979			1980e			1981e		
	USA*	non-USA	Total	USA	non-USA	Total	USA	non-USA	Total
Oil & Gas[1]	24,500	18,740	43,240	30,400	17,200	47,600	30,500	20,100	50,600
Manufacturing[2]	4,050	11,200	15,250	5,100	12,860	17,960	6,570	14,260	20,830
Marketing	1,700	2,100	3,800	1,170	2,400	3,570	1,350	2,740	4,090
Liquid Pipelines[3]	1,000	5,100	6,100	1,100	5,060	6,160	1,540	5,500	7,040
Marine Transport	3,200	7,010	10,210	3,700	6,700	10,400	4,170	7,400	11,570
Other Energy Resources[4]	4,050	3,700	7,750	4,660	4,040	8,700	5,010	4,810	9,820
Miscellaneous[5]	800	1,020	1,820	1,050	1,200	2,250	2,100	1,390	3,490
Sub Total	39,300	48,870	88,170	47,180	49,460	96,640	51,240	56,200	107,440
Gas Pipelines[3]	4,000	4,300	8,300	5,800	4,800	10,600	9,300	5,000	14,300
LNG/SNG[3]	700	2,000	2,700	630	2,220	2,850	450	1,000	1,450
Sub Total	4,700	6,300	11,000	7,020	6,430	13,450	9,750	6,000	15,750
TOTAL	44,000	55,170	99,170	53,610	56,480	110,090	60,990	62,200	123,190

NOTE: Most non-USA expenditures will be made by state-owned companies. It is difficult to draw a line between oil/gas operational costs and infrastructure costs. Refining has been neglected and outlays may be higher than estimated here. OPEC members have huge plans for refining and petrochemical complexes. Marine transport will grow mainly from government subsidies. Alternate energy resources will depend largely on government subsidies.

[1]Includes exploration expenses. [2]Refining and petrochemical plants owned by oil/gas companies. [3]PIPELINE & GAS JOURNAL estimates. [4]Coal, tar sands, oil shale, nuclear, solar, geothermal, biomass energy expenditures by oil/gas companies and governments, e.g., the U.S. Department of Energy has $2.2 billion for synfuel projects in 1980. [5]Energy-related investment. e-Estimate.
*USA means in the 50 states – not USA Oil companies' outlays.